

Teaching and Learning in Engineering (TALE)
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Lecture - 05
Accreditation

Greetings and welcome to Unit 5 of Module 1.

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Recap

- Outcome Based Education was proposed in 1970s in response to the need to develop instruments to obtain information on what students actually learn across schools.
- An outcome of education is what the student should be able to do at the end of a program/ course/ instructional unit.
- Four levels of objectives/outcomes are of concern in undergraduate engineering programs.

In Unit 4, we looked at Outcome-Based Education and outcome-based education was proposed in 1970s in response to the need to develop instruments to obtain information about what the students are actually learning across schools. It started with schools and then got extended to higher education programs. An outcome of education is what the student should be able to do at the end of a program, course or an instructional unit.

And we identified four levels of objectives or outcomes of concern to undergraduate engineering programs.

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Unit Outcomes

MIU5-1: Understand the role of Accreditation

MIU5-2: Understand the criteria of NBA Self Assessment Report

MIU5-3: Understand the centrality of closing the quality loop at the levels of COs, and PO and PSO



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Then coming to Unit 5, our goal or our aim is to understand the role of accreditation, understand the criteria of NBA Self-Assessment Report and understand the centrality of NBA accreditation in closing the quality loop at the levels of COs, POs and PSOs.

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Accreditation

- Accreditation of engineering programs was introduced to ensure that graduates of engineering programs have all the requisite characteristics of a good engineer.
- Many countries have identified such desirable characteristics of engineering graduates as Program Outcomes (sometime called Graduate Attributes) since 1990s.
- India identified the Program Outcomes for engineering programs in 2015.

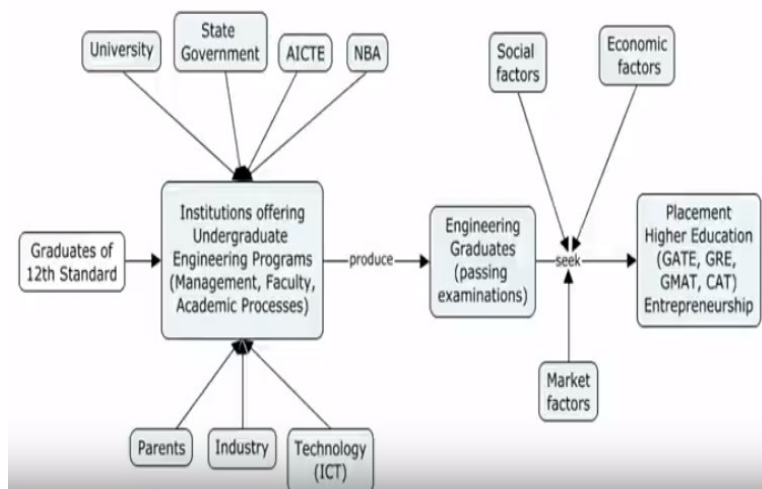
Now, what is accreditation? The after all any academic institute whether it is a school or an engineering college; an engineering college may be government, government aided or privately self-financing college, whichever way it is, it is a social institution. That means there are several people interested in the activities of such an institution starting from parents, government, students, industries and so on.

So one will have to really understand what are the needs of the all the stakeholders and whether the program is being conducted as per the at least perceived needs of the society at large. So accreditation of engineering programs was introduced to ensure that graduates of engineering programs have all the requisite characteristics of a good engineer. After all engineering institutions are required to produce good engineers.

So, accreditation is a process of ensuring that good engineers are being produced. Many countries have identified such desirable characteristics of engineering graduates. Some called as Program Outcomes, sometimes called Graduate Attributes since 1990s. Whereas National Board of Accreditation of India has been conducting accreditation also from middle '90s but they were following a different process we will presently see whereas India identified the program outcomes for engineering programs only in 2015. So we are only about 3 years old as of today.

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Engineering Education until recently



Now, let us look at how is the engineering education is looked at until recently that is prior to 2015. What it means these are the institutions offering undergraduate engineering programs. An institution is characterized by its management, faculty, and some established academic processes. And the main input is graduates of 12th standard. Occasionally you get a parallel entry from the graduates of diploma programs, we call it parallel entry.

But dominantly it is the graduates of 12th standard who come here. And who are the main stakeholders? They all have influence somehow on the academic processes, management and so on. Here the parents, industry, the technology here we mainly refer to information and computing technology. And then you have universities, state government, AICTE, National Board of Accreditation.

All of them will have some influence in all the academic processes and what kind of faculty are required and so on. And these together, this institute produces engineering graduates. Who are engineering graduates? Those who pass examinations that is it. And these graduates seek, there are only three activities broadly. Either they get placed in an industry or they go for a higher education by writing a examinations like GATE, GRE, GMAT, CAT and so on.

And then a very small percentage will become entrepreneurs. So, dominantly more than 80% are seeking placement immediately after graduation. Now this seeking placement is influenced by a large number of factors. Here social factors that is the family related issues. If somebody wants to go for a higher education but the family requires that he has to go and immediately seek a job, then he is forced to go for placement rather than higher education.

Similarly, economic factors. You are talking of the major economic factors of the country, economic scenario of the country and immediate market factors, where the jobs are. For example you have last 20 years IT industry has been the dominant employer of the engineering graduates. So this is what is the engineering education until recently.

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Accreditation prior to 2015

- The focus was on Inputs, Processes and Outputs
- Outputs were mainly, pass percentages, placements, number of graduates going for higher education, and the number of entrepreneurs.
- These outputs did not necessarily measure what the students learnt.



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So the accreditation prior to 2015 the focus was on inputs. Inputs could mean the curriculum, the kind of infrastructure that you have, and the faculty that you have, and then with all that you have certain processes going on, and then you measure the outputs. Outputs are mainly pass percentages, placements, number of graduates going for higher education and the number of entrepreneurs produced.

So there is a large gap between processes and outputs and it was found the outputs did not necessarily measure what the students learnt. One of the things that happened is, when the pass percentages are or let us say are becoming smaller and smaller, then the reaction had been of all managements and institutions saying that, that your assessment system, your examinations are tough and that is why they did not pass so you kind of water down the level of the examination.

And that is how it has been going on to ensure pass percentages. The quality of the exam papers have been more or less continuously coming down.

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Accreditation Post 2015

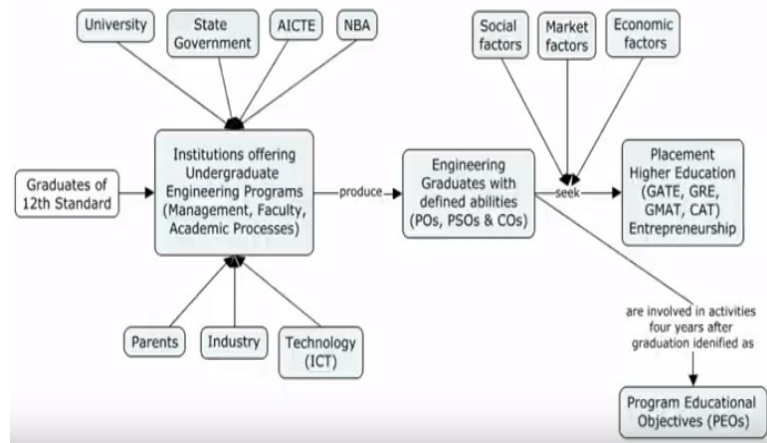
- The focus is on Inputs, Processes, Outcomes and their Attainment, and Outputs
- Outcomes represent what knowledge, skills and attitudes students have attained at the time of graduation.
- Outcomes are identified by NBA at the Program level, and by the Departments at Specific Program and Course levels.
- The Institution uses the results of calculating the attainment of outcomes to continuously improve the levels of outcome attainment.

Now, accreditation post 2015, the focus now is on inputs, processes and outcomes, outcomes and their attainment and outputs. So what happens you introduced one intermediary thing called outcomes and their attainment which differentiated pre and post 2015 accreditation process. Outcomes represent as we said what the knowledge and skills and attitude students have attained at the time of graduation.

Outcomes are identified by NBA at the program level and by the department at specific program and course levels. The institution uses the results of calculating the attainment of outcomes to continuously improve the levels of outcome attainment. These are the basic features of accreditation post 2015.

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Engineering Education in OBE-NBA framework 2015



Now how does this framework look like? All this part remains the same. Same stakeholders, same inputs, same kind of institute. Now what we say, they produce engineering graduates with defined abilities. These abilities are stated in terms of POs, PSOs and COs. They in turn seek the same placement, higher education and entrepreneurship. The same factors influence but you are also looking for, the graduates are involved in activities four years after graduation identified by Program Educational Objectives.

That means each program will have to introspect and find out what kind of engineers we want to, we want them to be and go and serve the society. So they are stated in terms of PEOs saying that how do I find out whether they are actually that you have attained these PEOs? That is by survey with your alumni where exactly they are after four to five years. And if your feedback shows that they are dominantly, not 100%, dominantly are involved in activities as stated by PEOs then you can consider your program to be reasonably successful.

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Accreditation

- Accreditation is a process of quality assurance and improvement, whereby a program in an approved Institution is critically appraised to verify that the Institution or the program continues to meet and/or exceed the Norms and Standards prescribed by regulator from time to time.
- It is a kind of recognition which indicates that a program or Institution fulfils certain standards.
- While all institutions in India acknowledge the importance of these Program Outcomes, most of them are yet to make efforts in adequately incorporating learning experiences that facilitate attaining these outcomes.

Now, what is the actual accreditation process? Accreditation is a process of quality assurance and improvement whereby a program in an approved institution is critically appraised to verify that the institution or the program continues to meet and or exceed the norms and standards prescribed by regulator from time to time. So, broadly there is an external agency which defines what is the, what are the criteria according to which the accreditation is performed.

And generally the accreditation is done by based on the data provided by the institution and as well as a peer team visiting the institution as following a very well, well-defined process and to translate that into a series of numbers which state that to what extent the criteria have been attained. It is a kind of recognition which indicates that a program or institution fulfils certain standards. When we say fulfils certain standards, you are talking about minimum requirements.

For example, an institution can do far better than as per the norms that are set by NBA. There is no limit on that. This is only to ensure that minimum standards are attained. While all at present all institutions in India acknowledge the importance of these Program Outcomes, most of them are yet to make efforts in adequately incorporating learning experiences that facilitate attaining these outcomes.

After all, it was only introduced in 2015 and educational institutions are generally notorious in terms of moving with the fast changing requirements of the either society or with of the industry

or accreditation bodies. Right now what is happening is only people are writing as because NBA requires that your writing your course outcomes and somehow computing the level of attainment of outcomes. But making Program Outcomes as a starting point for curriculum design is yet to start in majority of the institutions.

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Accreditation Process

- An Institution submits a document providing information on eligibility of the Departments seeking accreditation
- NBA after ensuring the eligibility criteria are satisfied asks the institution to submit Self Assessment Reports (SARs) of the programs sought to be accredited.
- The Institution submits SARs prepared by the Departments.
- NBA uses the mechanism of peer review to evaluate the program.

Further, what is the process involved? An institution submits a document providing information on eligibility of the departments seeking accreditation. There is some information related to which is again defined by NBA. The institution submits a document called eligibility criteria. If the eligibility criteria proved or met as per NBA, then NBA formally request the institution to submit what is called Self-Assessment Report which has a very detailed structure to it, and the program which is seeking accreditation submits a detailed document through the institution.

The institutions, the SAR or Self-Assessment Report is prepared by the department. Generally it requires collating the data over a period of 5 years and converting them into a large number of what do you call the into some kind of numbers to indicate that to what extent something has been attained. And NBA uses the mechanism of peer review to evaluate the program.

So, this becomes a fairly elaborate process and by following this process it is felt that the quality of learning will greatly improve. That is the underlying belief of any accreditation process.

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Self Assessment Report

- SAR is compilation of such data and information pertaining to a given program for its assessment (identifying strength and weaknesses) vis-à-vis accomplishment of defined POs and PSOs by the college itself.

SAR has two parts

- Part-I seeks Institutional /Departmental information
- Part-II seeks information on ten criteria



And what is Self-Assessment Report? SAR is a compilation of such data and information pertaining to a given program for its assessment identifying its strengths and weaknesses. These are the accomplishment of defined POs and PSOs by the college itself. That is what the Self-Assessment Report. SAR has two parts. Part 1 seeks institutional and departmental information. It is purely data. How many students, how many faculty are there, when did the program start and so on and on. It is all institutional and departmental information.

Part 2 seeks information on 10 criteria. We will be looking at the details of NBA accreditation process and how to meet the requirements in a completely separate module where we spend lot more time on every aspect of SAR.

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SAR Criteria

Criteria No.	Criteria	Tier 1 Marks	Tier II Marks
Program Level Criteria			
1.	Vision, Mission and Program Educational Objectives	50	60
2.	Program Curriculum and Teaching-Learning Processes	100	120
3.	Program Outcomes and Course Outcomes	175	120
4.	Students' Performance	100	150
5.	Faculty Information and Contributions	200	200
6.	Facilities and Technical Support	80	80
7.	Continuous Improvement	75	50

Now coming to SAR criteria, at the program level what one has to look at is Vision, Mission and Program Educational Objectives have to be written and here the whole accreditation is done as per some kind of a marking system. The maximum marks are 1000 and these 1000 marks are divided into in case of NBA about 10 criteria. And each criterion may have a different set of marks assigned to that.

And in India you have two types of institutions which are called Tier 1 and Tier 2 institutions. Tier 1 institute is academically autonomous starting with IITs, NITs and so on and also you have several autonomous institutions affiliated to university. When they are affiliated to university, they still have to follow some guidelines set up by the university. And so to that extent they become depending on how you view it as guidelines or constraints.

But they are academically autonomous institutions. That means they are responsible for their own thing. And Tier 2 institutions which are very large in number in India. More than 90% of engineering colleges in India belong to the Tier 2 category. That means there are many academic decisions or in terms of assessment they are centrally controlled. University will define what the curriculum is. University is the one that arranges for final examination and evaluation of student performance, declaring the results everything. So to that extent Tier 1 and Tier 2 institutions are somewhat different and to that extent the marks that are allocated to different criteria, they are different.

But the criteria remain the same for both. Vision, Mission, and Program Educational Objectives Tier 1 carries 50 marks and Tier 2 carries 60 marks. Actually, this set of marks are again allocated when you come for the first time for accreditation.

When you come for the second time for accreditation the marks are different but that has not been yet decided because as per the new accreditation criteria or accreditation process no one has yet come to the level of second round accreditation as per the 2015 specifications. Now coming to program, curriculum and teaching, teaching learning processes, Tier 1 carries 100 marks and Tier 2 carries 120 marks.

Program outcomes and course outcomes 175 for Tier 1 and 120 for Tier 2. Students' performance, here Tier 1 100 marks and Tier 2 150 marks. Faculty information and contributions, they are the same for both, 200 marks. If you look at, 200 is the largest number out of the 1000, 1000 marks that you have and to this extent NBA recognizes truly the faculty are the main players in undergraduate education and they are the truly change agents. They really recognize that the crucial role of faculty in making or leading to training good engineers.

Facilities and technical support 80 marks each. And continuous improvement. You have to demonstrate that from one year to the other you are making efforts to continuously improve your activities. So that carries 75 for Tier 1 and 50 for Tier 2 institutions.

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SAR Criteria

Criteria No.	Criteria	Tier 1 Marks	Tier II Marks
	Institute Level Criteria		
8.	First Year Academics	50	50
9.	Student Support Systems	50	50
10.	Governance, Institutional Support and Financial Resources	120	120
	Total	1000	1000

And now coming to institute level criteria, generally these days first year academics is kind of common across the college. They are not the responsibility of the department. So first year academics is the institution level criterion and they carry 50, 50 marks each and student support systems that you have in the institution carry 50, 50 and governance, institutional support and financial resources they are given 120, 120.

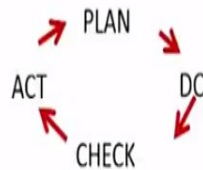
This is a significant deviation from the earlier accreditation process that is a good system of education requires good governance and the right kind of financial resources and that carry 120 as you can see the total is 1000 marks. So possibly India is one of the few countries which goes for this kind of a marking system of having 1000 marks, dividing them into several criteria and based on the number of marks that you get there is some decisions get taken. We are not going to talk about that. And they will be, unless you cross a certain threshold you will not be accredited.

And even if you are accredited, again the accreditation is for a limited period. It could be 3 years or it could be 6 years depending on the number of marks that you get, okay? But even if you are performing extremely well, one every institute or every program has to come back after 6 years to prove that you are continuing to do well, okay?

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Closing the Quality Loop

- All the processes required for accreditation need to have the step of “closing the loop”.
- A model useful for understanding this is the Deming's Quality Cycle:



Now, one of the important features of accreditation is the Quality Loop. All the processes required for accreditation need to have this step of closing the loop. The model to capture this closure of the loop is the Deming's Quality Cycle. Those of the faculty who are familiar with quality related courses, they will be familiar with that. What it says “plan”, you have to plan for something and actually have to perform and measure whether you have performed or not.

To what extent you have performed. You check how far you have performed with respect to the target set and if there is a deviation from the target then you have to act for that and acting would mean again it has to get translated into plan next time you do the again repeat that activity. So plan, do, check, and act is the basic quality loop.

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Quality Loop

- We plan the activity; do it; measure the performance (CHECK); and finally based on what was planned and what was actually achieved, initiate appropriate action commencing the next round of the quality cycle.

ACTION:

- If the attainment lags behind the planned target, we need to further analyse the reasons for the same and plan suitable corrective actions for the next round.
- If the achievement exceeds the planned target, we need to “raise the bar”, and then we need to plan for achieving the new target level.



So quality loop again to complete this, action, if the attainment lags behind the planned target, we need to further analyze the reasons for the same and plan suitable corrective actions for the next time round. If the achievement exceeds the planned target, we need to raise the bar. That means I want to do better than what I have been doing and I raise the bar okay that is what action is.

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Continuous Improvement

- The quality of learning will depend very much on the context characterized by students, teachers, processes as determined by the system, technology, curriculum and infrastructure.
- Closing the quality loop enables the Departments to focus on what specific actions lead to incremental improvements.
- Continuous improvement in the quality of learning is what characterizes the essence of the present NBA accreditation.

And again as I said continuous improvement is one of the criterion of NBA accreditation. Quality of learning will depend on, depend very much on the context characterized by students, teacher, processes as determined by the system, technology, curriculum and infrastructure. All of them

change. So what happens, if you want to improve you have to look at each one of them and to see how, what is it that I can do?

Does it require infrastructure or does it require use of a new technology or some system level improvements have to take place or the curriculum itself has to be altered. Closing the quality loop enables the departments to focus on what specific actions lead to incremental improvements. Continuous improvement in the quality of learning is what characterize is the essence of present NBA accreditation.

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Assignments

- What is the differences between outputs and outcomes?
- Who is benefitted by Accreditation and how? (Write in 250 words maximum)
- What in your view are the advantages and disadvantages of Accreditation? (Write a maximum of five each)
- Present your own view through a diagram of the dependence of the quality of learning on specific factors related to a course you taught.

Now, coming to some assignments, try to answer these questions. What is the difference between outputs and outcomes? Who is benefitted by accreditation and how? Write some 250 words maximum. What in your view are the advantages and disadvantages of accreditation? Present your own view through a diagram of the dependence of quality of learning on specific factors related to a course that you taught.

You capture in your own view what are all the factors that contributed to the end result. That is you can present it in the form of a picture and if you want add a few comments to that.

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MIU6

- Understand the nature and importance PEOs and PSOs in design and conduct of engineering programs

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The next unit will look at understanding the nature and importance of PEOs and PSOs in design and conduct of engineering programs. So we look at PEOs and PSOs in the following unit. Thank you for your attention.